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**TRANSLATION OF THE ANNEXES TO THE  
INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT  
UNDER PCT ARTICLE 36**

DE-A 198 60 142 discloses multilayer, biaxially oriented tubular polyamide-based films which have been conditioned so as to be ready-to-fill. The tubular films are conditioned via spraying with water, which may, if appropriate, comprise a conventional fungicide, such as a quaternary ammonium compound, and/or a conventional preservative. Both sides of the tubular film are preferably sprayed.

EP-A 190 630 discloses a foodstuff casing, if appropriate fiber-reinforced, based on regenerated cellulose, on cellulose ethers, or on other hydrophilic polymers, with premoistening so as to be ready-to-fill, using at least 40% by weight of water. In order to protect the casing from infestation by bacteria, mold fungi, or other microorganisms, it has been treated with an antimycotic agent. The agent is preferably an alkyl para-hydroxybenzoate.

US-A 3 864 499 also describes a casing composed of film-forming, hydrophilic polymers, in particular of regenerated cellulose. Dispersed within the polymers there are oil-soluble additives, in particular antioxidants, biocides, dyes, UV absorbers, flavors, or aromas. A cellulose sausage casing is also disclosed and comprises an antimycotic agent approved under foodstuffs legislation. The antimycotic agent is preferably methyl, ethyl, or propyl para-hydroxybenzoate.

DE 196 25 094 discloses a shirred stick composed of a single- or multilayer, biaxially oriented and heat-set, tubular polyamide-based foodstuff casing. Prior to shirring, the casing is sprayed with a solution which comprises an emulsifier, and preferably also comprises a bactericide, which is not characterized in further detail, and a lubricant.

These shortcomings gave rise to the technical object of providing ready-to-fill premoistened tubular plastics casings which have dependable and longlasting preservation properties, but where the agent used for preservation does not attack the casing material or adversely affect the foodstuff subsequently used as filling. The agent is moreover to have a broad spectrum of action, i.e. be effective against a maximum number of the types of the microorganism, and is to be effective irrespective of pH. The preservative is moreover, if at all possible, to be capable of application to the inner and/or outer side of the casing without an additional step in the process. It is preferably to be capable

of combination with agents which improve peelability and to be capable of application together with these.

5 The object is achieved via the use of alkyl para-hydroxybenzoates and/or of their salts. It has been found here that antimicrobial activity rises with chain length in the alkyl moiety. Butyl para-hydroxybenzoates are therefore more effective than the corresponding ethyl ester, which in turn is more effective than the methyl ester.

10 The invention therefore provides an antimicrobial, tubular, single- or multilayer polymer-based foodstuff casing premoistened so as to be ready-to-fill, which comprises, as antimicrobial constituent, an alkyl para-hydroxybenzoate and/or a salt thereof.

15 The alkyl para-hydroxybenzoate or its salt (both also referred to below by the abbreviated term PHB ester) advantageously contains from 1 to 10, preferably from 1 to 6, particularly preferably from 2 to 5, carbon atoms in the alkyl moiety, which is generally not a branched moiety. The salt mentioned is preferably a potassium or sodium salt. Unlike most preservatives, the PHB  
20 esters have antimicrobial action particularly irrespective of the pH, i.e. they are effective in an acidic medium or in an alkaline medium against fungi, yeasts and bacteria (*E. coli*, *Salmonellae*, *Staphylococci*, etc.). The antimicrobial properties are attributed to an interaction with the cell membrane and with the proteins in the cell of the microorganisms. In this process, the lipid membranes  
25 are penetrated and damaged.

If appropriate, the PHB ester has been combined with other antimicrobial agents. These are in particular organic acids, such as formic acid, propionic acid, or sorbic acid, or else salts thereof, such as sodium sorbate or potassium  
30 sorbate. Because the sorbates have no fungicidal action, only the undissociated sorbic acid having this action, the pH of the solution is to be lowered via addition of lactic acid, which itself has bioacidic properties, or of other mild organic acids, sufficiently to generate a sufficient amount of sorbic acid. To this end, the pH should be adjusted below 6. However, the  
35 precipitation of sorbic acid has to be inhibited here. Other antimicrobial substances are those which reduce water activity, i.e. lower the  $a_w$  value.

These are in particular polyhydric aliphatic alcohols, such as glycerol or propanediol. The term "antimicrobial" in the present application means bactericidal, bacteriostatic, fungicidal, and/or fungistatic. Another particular bacterial substance which may be used is 1,2-benzisothiazolin-3-one.

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The content of all of the antimicrobial agents together in the solution used for premoistening is generally from about 0.1 to 8% by weight, preferably from 0.2 to 2% by weight.

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The PHB ester is advantageously applied in one step to the inner and/or outer side of the tubular film with the water serving for premoistening. In one particularly simple embodiment, an aqueous solution is applied by spraying and comprises the preservative(s) and, if appropriate, other constituents. Another possible method of external preparation is to pass the (collapsed) casing through a saturation trough or use external spraying prior to finishing processes. The general method of internal preparation is use of a spray mandrel during shirring of the casing. Application of the premoistening solution to the inner and the outer side is particularly advisable in the case of those multilayer casings which have internal water-vapor-barrier layers.

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The aqueous composition used for pretreatment with water in the case of ready-to-fill shirred sticks may moreover comprise components which make the casing easy to peel (easy-peel preparation). However, easy-peel capability is not desirable for every application. Indeed, relatively high sausage meat-emulsion adhesion is often demanded in order to prevent formation of gel deposits.

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According to the present invention, it is especially polyamide-based foodstuff casings that are premoistened so as to be ready-to-fill, and also casings which comprise polyamide in at least one layer. The polyamide is generally aliphatic and/or partly aromatic polyamide. The aliphatic polyamide is preferably a linear aliphatic polyamide, such as PA 6, PA 11, or PA 12, or a linear aliphatic copolyamide, such as PA 6.66, PA 6.9, PA 6.10, PA 6.11, or PA 6.12. It is also possible to use mixtures of polyamides and copolyamides. The multilayer casings generally comprise not only at least one PA layer forming the outer and/or inner surface of the casing but also at least one water-vapor-barrier

layer. This is preferably composed of polyolefin(s), such as polyethylene, polypropylene, polybutylene, or else the copolymers composed of ethylene and/or propylene and of  $\alpha$  olefins having from 4 to 8 carbon atoms. The polyolefins may have been end-group-modified in order to improve adhesion to adjacent layers, in particular to polyamide layers. Other layers may be present, in particular adhesion layers between PA layers and polyolefin(PO) layers.

Polyamide casings or polyamide layers absorb up to about 6% by weight of water in the interior of the cross section, and this means that water is a swelling agent for polyamides. Because the diffusion process is time-dependent, an excess of the solution for pretreatment with water is applied to the surface. The amount of aqueous solution applied should be from 10 to 150% by weight, preferably from 20 to 100% by weight, based in each case on the weight of the tube. In order to provide uniform preparations, rapid run-off of the solution is to be inhibited, and this means that the composition is to be such that the liquid used for premoistening is "held" on the surface. One way of achieving this is to increase the viscosity or to add an oil emulsion. For viscosity increase, use is especially made of polyhydric alcohols, such as glycerol or sorbitol, and also of polyacrylic acids or of other thickeners; suitable oils are especially natural oils, such as olive oil, rapeseed oil, or sunflower oil, or else synthetic triglycerides (obtainable, by way of example, as @Softenol). They may be added at a concentration of from 1 to 40%, preferably from 2 to 15%, to the preparation solution. The viscosity is advantageously adjusted so that the solution can be applied without difficulty by spraying.

The internal water pretreatment can be combined with an easy-peel preparation to improve peelability, by treating the preparation solution, which at this stage comprises an oil emulsion, with the known easy-peel-action components. Components which may especially be used for this purpose are cellulose derivatives and starch derivatives, alginates, and chitosan. They are used at a concentration of from 0.1 to 8%, preferably from 0.5 to 2.5%. At higher concentrations, the grades to be used are those of correspondingly low viscosity, e.g. carboxymethylmethyl-, hydroxyethyl-, or methylhydroxyethylcellulose-10, -20, or -30.

What is claimed is

- 5 1. An antimicrobial, tubular, single- or multilayer polymer-based plastics foodstuff casing premoistened so as to be ready-to-fill, which comprises, as antimicrobial constituent, an alkyl para-hydroxybenzoate and/or a salt thereof.
- 10 2. The foodstuff casing as claimed in claim 1, wherein the alkyl para-hydroxybenzoate or its salt contains from 1 to 10, preferably from 1 to 6, particularly preferably from 2 to 5, carbon atoms in the alkyl moiety.
- 15 3. The foodstuff casing as claimed in claim 1 or 2, wherein the alkyl para-hydroxybenzoate and/or its salt has been combined with at least one other antimicrobial agent.
- 20 4. The foodstuff casing as claimed in claim 3, wherein the other antimicrobial agent is an agent which reduces water activity, i.e. a  $a_w$  value.
- 25 5. The foodstuff casing as claimed in claim 4, wherein the agent which reduces water activity is glycerol or propanediol.
6. The foodstuff casing as claimed in one or more of claims 1 to 5, whose inner side has been impregnated with at least one component which improves peelability.